BIOINFORMATICS IN TYPE 1 DIABETES: OXIDATIVE STRESS AND COMPLICATIONS

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The National Center for Integrative Biomedical Informatics (NCIBI) was funded by the NIH in 2005 to develop tools that allow researchers to integrate and understand the enormous quantity of information available to them. While most of the Center researchers are computationally oriented, the Driving Biological Problems (DBPs) provide both a target and a test bed for their tools. One of these DBPs is understanding and finding treatments for the complications of Type 1 Diabetes Mellitus. The specific aims of this DBP are to understand the link between oxidative stress caused by excessive glucose and its adverse effects on cellular function and cell death in tissues prone to diabetic complications. Animal and in vitro experiments implicate a number of enzymatic and non-enzymatic pathways of glucose metabolism in the initiation and progression of complications. Recently a link has been established that provides a unified mechanism of tissue damage. Cellular pathways become perturbed as a direct or indirect consequence of hyperglycemia-mediated superoxide overproduction by the mitochondrial electron transport chain. This increase in reactive oxygen species (ROS) reflects an overall increased state of cellular oxidative stress. Inhibition of ROS or maintenance of euglycemia restores metabolic and vascular balances and blocks both the initiation and progression of complications.

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